

USING TSUPREM-IV IN SWEET HALL

INTRODUCTION

TSUPREM-4 is a computer program that allows the user to simulate the various processing steps used in the manufacture of Si ICs. The processing steps simulated are: inert ambient dopant drive-in; thermal oxidation of Si and silicon-nitride; ion implantation, epitaxial growth of Si; and low temperature deposition or etching of various materials. TSUPREM-4 simulates in two dimension the changes in a semiconductor structure as a result of the various processing steps used in its manufacture. The primary results of interest are the thicknesses of the various layers and the distribution of impurities within those layers.

TSUPREM-4 is currently installed on the *elaine*, *epic* and *saga* workstations, which are physically located in Sweet Hall on campus. These workstations share a common file server. To have access to the *elaine*, *saga* or *epic* systems, you must have an account on *leland*. If you don't already have one, you may open an account for yourself as long as you are a registered student at Stanford.

To open an account on *leland*, first get a connection to an *elaine* machine by going directly to Sweet Hall, by using the TIP terminals at CIS, or by telnet. Once you are on the system, follow the on-screen instructions step by step to have your account opened. Note: it may take 24 hours before your account is activated, so be sure to do this well in advance of the homework due date(s).

Initializing TSUPREM-IV on your *Leland* Account

Once you have established an account on *leland*, you may log into any of the *elaine* (*elaine1* to *elaine54*) computers. The first time you log in, you need to complete the following steps before you can actually run SUPREM-IV:

1. Use a text editor (vi or emacs) to add the following lines to the end of your `.cshrc` file:

```
# Initialization command to run TSUPREM-IV
setenv LM_LICENSE_FILE /afs/ir/class/ee/hspice/2001.2/license.dat
```

2. These commands will take effect the next time you log in. You can also type
`source .cshrc`
to have them take effect immediately.

Running TSUPREM-IV from an *Elaine* Workstation in Sweet Hall

1. Once you log in, you must invoke X-Windows to use TSUPREM-IV by typing `x`.
2. You can now run TSUPREM-IV by issuing the command:

```
tsuprem4 <your_input_filename>
```

Running TSUPREM-IV from a Remote Workstation

If you access the elaines from a remote workstation running X11 (X-Windows), you need to have the environment variable DISPLAY set correctly. To do this, you need to follow these steps:

1. Determine the correct DISPLAY variable for your local machine by typing

```
printenv DISPLAY
```

on your local machine. If you get "unix:0.0" or "unix:1.0", do not use the word "unix" for step 2. Instead, replace it with the name of your machine, which you can obtain with the command `hostname`.

2. Allow X connections from the *elaine* machine to your local machine. For example, if you are going to run TSUPREM-IV on *elaine25*, type this on your local machine:

```
xhost elaine25
```

3. Specify to the remote machine (*elaine*) what your local display is:

```
setenv DISPLAY <local_machine_name>
```

where *<local_machine_name>* is the DISPLAY name given by the `printenv` command in step 1 (e.g., `sensei:0.0`).

4. You can now run TSUPREM-IV by issuing the command:

```
tsuprem4 <your_input_filename>
```

Plotting TSUPREM-IV Output

By default, TSUPREM-IV will plot to your window system if you are running X. In order to plot to a PostScript printer, you must first specify to TSUPREM-IV to direct the plot output to a PostScript file. Once the PostScript file is created, you can then send that file to a printer. This is done by the following:

1. On the plot line in your TSUPREM-IV input file, append the `device=ps` option as follows:

```
option device=ps <all your other options>
```

2. The plot output will now be saved in a file called `plotfile.ps`. To print this out, use the `lpr` command:

```
lpr -P<printer_name> plotfile.ps
```

You should rename the `plotfile.ps` file as soon as it is generated since TSUPREM-IV will overwrite it without warning in subsequent runs.

SUPREM-IV PDF Documentation

A PDF version of the tsuprem4 documentation (containing examples) can be found in /usr/class/ee410/tma/manuals_pdf/tsuprem4_2002.4.0/S4_2002.4.pdf and can be read using the Acrobat reader (acroread).

SUPREM-IV examples

Several example decks can be found in the /usr/class/ee410/tma/tsuprem4_2002.4.0/examples/ directory.

A good example to look at, to get started with tsuprem4, would be the s4ex1a.inp file in the above directory. Detailed documentation regarding this example is available in Tutorial Examples section in the PDF file above.